REMARKS

By the foregoing Amendment, Claims 18-39 are cancelled and new Claims 40-56 are presented. Therefore, Claims 1-17 and 40-56 remain pending. Claims 1-17 have been allowed.

In point 3 the Examiner contradicts Patent U.S.-5,151,246 Sept. 29, 1992.

Observations are related to the:
1) processes of obtaining metal foams;
2) hot rolling of powders.

On observation 1. The common processes of the powder metallurgy are actually contradicted, namely: mixing powders, pressing of powder mixtures into blanks and sintering of obtained blanks by heating.

Joachim Baumeister also took these processes from Patent U.S.- No.3,087,807 (1962), which he took as prototype and obtained Patent U.S.- No.5,151,246 (1992.). By the way, all publications in the field of powder metallurgy, including patents on metal foams, include the following processes:

- obtaining metal powders and alloys;
- preparing powder compositions by mixing;
- forming powder compositions into blanks (by pressing, extrusion, rolling, etc.);
- sintering blanks at temperatures, ensuring diffusion welding of powder particles;
- additional treatment of semifinished products into a finished product.

A method of obtaining metal foams, according to patent U.S.- No.3,087,807 (1962), includes the processes:

1) mixing metal powders with a foaming agent (TiH_2, $CaCO_3$ and other.);
2) cold pressing of the powder mixture into a blank;
3) hot extrusion of the blank into precursors (foamable objects);
4) foaming precursors by heating.

A method of obtaining metal foams, according to patent U.S.-5,151,246 (1992), includes the processes:

1) mixing metal powders with a foaming agent (TiH_2, $CaCO_3$ and other.);
2) hot pressing of the powder mixture into precursors;
3) foaming precursors by heating.

The comparison of "methods" shows that there are no elements of novelty in the processes used. Patent U.S.- No.5,151,246 (1992) is differed from patent U.S.- No.3,087,807 (1962) only in that that the powder mixture directly undergoes hot compacting, passing preliminary pre-compaction, i.e. "cold pressing".

Please note that hot methods of compaction (pressing, extrusion, rolling, etc.) of powder compositions are not usually used without preliminary pre-compaction, because metal powders in the filling state contact each other on 0.000001 part of the surface, i.e. they are disengaged. Therefore, powders occupy large volumes and are very badly sintered. Particles mast be drawn together to the contact in order to avoid oxidation and to ensure good-quality sintering. If we load metal powders in a mold and heat them for compaction, they will be sintering to the walls of the mould, causing scores. Besides, the press-moulds of large sizes will be required, which will substantially increase the cost and will hinder their operation.

Therefore, it is expedient to carry out pre-compaction and then hot pressing or hot rolling.

Also note that it is impossible to obtain massive products by hot pressing and also products of large dimensions. Furthermore, the structure of hot-pressed products is heterogeneous, i.e. there is a high percentage of residual porosity, which adversely affects the foaming process.

On observations 2. First of all, let us compare the methods of obtaining metal foams by hot rolling.

Method (II) according to the patent U.S.- No.5,151,246 (1992):

1) mixing metal powders with a foaming agent (TiH_2, $CaCO_3$ and other);
2) heating the powder mixture (to 360-400 °C);
3) hot rolling of the powder mixture;
4) foaming the obtained rolled product.

A method according to our patent application No.10/619,717:

1) mixing metal powders with a foaming agent (TiH_2, $CaCO_3$ and others);
2) filling the powder mixture into a metal container;
3) heating the container with the mixture;
4) hot rolling of the container with the mixture;
5) foaming the obtained rolled product.

In patent U.S.-No,5,151,246 (1992) (Example 7) the mixture of aluminum powder and titanium hydride is heated to 350-400 °C and is given to the heated rolls of the rolling mill. Hot rolling of metal powders in the filling state did not find practical

application in the powder metallurgy since it is connected with the difficulty of technological performance.

The difficulty is in that, that during the heating of metal powders and giving them to hot rolls, they are not only oxidized, but still are lumped as a result of agglomeration of particles. Therefore, it is impossible to charge them as a uniform layer on the rolls. Furthermore, they adhere (welded) to the working surfaces of the rolls in the process of rolling, which leads to grasping of powder mass and rolls, and, consequently, to a breakdown of the rolling mill. Finally, the processing of metal powders in the filling state requires the strictest safety regulations. In particular, the application of shielding (oxidation-free) environments and complete hermetic sealing of the process, including technological equipment, since the explosions of metal powder are inevitable, particularly containing hydrides metals (TiH_2 and others).

In our application No. 10/619,717 compacting of powder compositions is made in metal shells (containers), i.e. under conditions of *closed volume*. This substantially simplifies the technology of obtaining metal foams:

- with the rolling in the containers, there is no direct contact of metal powders with the forming tool, i.e. with the rolls. This excludes adhesion of the particles of the powders on the working surfaces of the rolls, as a result of their welding and adhesion (grasping);
- dust formation and mechanical losses of powder components in the process of their processing and also their explosiveness are excluded;
- application of containers gives the possibility to obtain the rolling of different thickness (3-100 mm and more) and of width (to 1500 mm);

- the container fulfills not only technological functions, but it is also a structural element of metal foam of the type "sandwich", i.e. it is not removed. The lateral sides of the container (precursor) are treated by cutting for providing marketable form.

2. Cold and hot compaction of powder compositions, and also deformation treatment of precursors (unrolling to the required thickness of sheet, giving to the blank specific profile), are accomplished by rolling, i.e. by the most highly productive process in the technology of treating metals by pressure.
It is possible to obtain sheets, strips, panels, rolled bar stock (profiles), elements of structures and ether products by rolling.

3. As it is known, the process of "foaming" metal foams is accomplished in metal forms (moulds, ingot moulds), which not only complicates the technology as a whole, but also it requires significant capital expenditures. Moulds are structurally built, metal-consuming and being very expensive, and the periods of their service are short because of the thermal deformation (bending) and the rapid wear.

In sandwiches metal layers (laminated coatings) are actually the shaping molds, therefore, the application of special moulds is not necessary. This places the technology in discharge of economically advantageous.

4. With operating heatings (the hot rolling of containers, deformation treatment of precursors and foaming of sandwiches), oxidation of the powder compositions and of the losses of gases during the thermal dissociation of foaming agents are eliminated ($TiH_2 \rightarrow Ti + H_2 \uparrow$; $CaCO_3 \rightarrow CaO + CO_2 \uparrow$).
This provides ecological purity of the production, and also obtaining the uniform structural porosity, i.e. high-quality production.

5. Metal foams of the type "sandwich" are characterized by combination of functional properties. In particular, they possess as acoustic so as vibration damping properties. This classifies them as the newest materials of the XXI century.

Comparative analysis clearly shows the advantages of the declared "method" No.10/619,717. In this regard, the point 3 observed by the Examinator causes surprise: "Claims 18-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baumeister et al."

It is sufficient to note that Baumeister's reasons that you cited in point 3 are well-known truths, which are presented in the elementary manuals on powder metallurgy for students.

Naturally, we are no agreeing with this conclusion. Novelty and authenticity of claim No.10/619,717 is confirmed in practice. Firm TARON organized aluminum foam production of the type "sandwich". The basis of the technology is the processes presented in claim No. 10/619,717, in particular, the hot rolling of powder compositions in metal containers. The technology of obtaining sandwiches, plated by sheets from aluminum, titanium and the stainless steel, has been mastered. They meet world standards on to quality and marketability.

We request to examine our explanations on point 3, We are ready to provide you with additional information if necessary.

For the foregoing reasons, Applicant respectfully submits that all pending claims, namely Claims 1-17 and 40-56, are patentable over the references of record, and earnestly solicits allowance of the same.

Respectfully submitted,

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Amendments to the Drawings:

No amendments are made to the drawings herein.